REMARKS

Entry of the foregoing amendment and favorable reconsideration of the subject application is respectfully requested in view of the following comments.

Claims 1-5 are currently pending in the subject application. By the foregoing amendment, claims 1, 3 and 4 have been amended and new claims 6-10 have been added. Accordingly, claims 1-10 are herewith presented for the examiner's consideration.

Claims 1 and 3 have been amended in response to the examiner's rejections under 35 U.S.C. §112, second paragraph. Specifically, claim 1 has been amended to more clearly set forth the method of the present invention by more positively reciting the method as comprising plastic working a ceramics sintered material cutting tool with an abrasive composed of fine particles where the fine particles have the recited features thereby providing the required link between claims 1 and 3. In addition, claim 1 has been amended to clarify the confusion with regard to the Vickers hardness value of the fine particles. That value is now recited as "ranging from 500 to a value which is the hardness of said sintered material cutting tool plus 50", which is supported by the specification at page 3, lines 33-35.

Claim 3 has been amended to correct grammatical errors and to specify that the plastic working is carried out by shot blasting the sintered material cutting tool with the abrasive particles under the recited conditions, thereby further

clarifying the method and the link with claim 1 from which claim 3 depends.

Claim 4 has been amended to correct its dependency from claim 2 to claim 3.

New claims 6-10 are presented herein in response to the examiner's indication of allowable subject matter. Claim 6 corresponds to claim 3 incorporating the amendments to overcome the rejection under 35 U.S.C. §112, and rewritten in independent form including all of the limitations of claim 1. Claim 7 corresponds to claim 4 dependent from claim 6, and claims 8-10 recite further characteristics of the abrasive particles and the sintered material cutting tool used in the method. Applicants respectfully submit that claims 8-10 are fully supported by the specification as filed.

No new matter has been entered by these amendments.

Rejection of Claims 1 and 3 Under 35 U.S.C. 112, Second Paragraph

Claims 1 and 3 have been rejected under 35 U.S.C. §112, second paragraph. The Office Action states:

> "Claim 1 provides for the use of abrasives in surface toughening of a ceramics sintered material cutting tool, but, since the claim does not set forth any steps involved in the method/process, it is unclear what method/process applicant is intending to encompass. A claim is indefinite where it merely recites a use without any active, positive steps delimiting how this use is actually practiced.
>
> Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

It is not clear whether claim 1 claims a hardness of 50 and above or 50 and less since the claims recites "+50" followed by "or less".

Claims 1 and 3 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
A link is missing between claims 1 and 3 in surface toughening of a ceramics sintered material cutting tool. Claim 3 depends upon claim 1."

Applicants respectfully submit that the foregoing amendments to claims 1 and 3 have overcome the rejections under 35 U.S.C. 112 by setting forth the method as comprising at least one step, by clarifying the recitation of the hardness of the fine particles to being a range of from 500 to a value which is the hardness of the sintered material cutting tool plus 50, and by providing a link between claims 1 and 3, specifically, the "plastic working" step.

Accordingly, Applicants respectfully submit that the rejections under 35 U.S.C. §112, second paragraph, have been overcome.

Rejection of Claims 1-2, and 4-5 Under 35 U.S.C. 103(a)

Claims 1-2 and 4-5 have been rejected under 35 U.S.C. 103(a) as obvious over Yamamoto, et al., (U.S. Pub. 2003/0027707), in view of Nawa, et al., (U.S. Pub. 2004/0067839). The Office Action states:

"Yamamoto et al. teach a sintered alumina ceramic and its production by controlling the particle size of the alumina particles in which the disclosed sintered alumina ceramic has both high strength and high

hardness and is used as a cutting tool ([0006], [0008], [0018]). The alumina particles have an average particles size of 4.0μm or smaller ([0009], [0018]). In addition, the disclosed sintered alumina ceramic yields a Vickers hardness of 1800 or higher, preferably 1900 or higher and more preferably 1950 to higher at room temperature ([0027]). It, also, exhibit a Vickers hardness of 800 or higher, preferably 820 or higher, and more preferably 850 or higher at 1000°C ([0027]).

Yamamoto et al. is silent as to a linear dislocation in the ceramics sintered material.

Nawa et al. disclose a ceramic composite material made of fine Al_2O_3 grains and ZrO_2 grains dispersed in each other which is sintered to give rise to the disclosed composite ceramic material having excellent wear resistance and hardness as well as mechanical strength ([0009], [0034]). Nawa et al., further, disclose that the Al_2O_3 particle size is in the range of 0.1 to 0.5μm ([0012]). Additional Nawa et al. disclose that the residual stress generated around each of fine grains dispersed within the crystal grain during cooling procedure after sintering, cause dislocation within the respective crystal grains; the dislocations piled up each other and eventually form sub-grain boundaries within the crystal grains ([0034]).

It would have been obvious to a person of ordinary skill in the art to modify Yamamoto et al. to include the dislocation occurring in the crystal grains of the ceramic material in the cooling process after sintering as that taught by Nawa et al. motivated by the fact that both references disclose a sintered alumina base ceramic material which ahs Al_2O_3 grains; in addition, the ceramic material disclosed in both demonstrate a high mechanical strength, toughness, excellent wear resistance and toughness.

It is noted that even though the references do not teach a dislocation in the ceramic material in the range of $1x10^4$ to $1x10^{13}$ cm^{-2}, they disclose sintered ceramic material used as cutting tools having excellent toughness and hardness with overlapping ranges for the particles size and hardness as claimed in the instant application. The references disclose a material with most of the properties claimed in the instant application, which has similar utility; therefore, the claimed dislocation value is assumed to be inherent to the sintered ceramic material used as a cutting tool.

See MPEP §2112.01."

Applicants respectfully traverse the rejection on the ground that the references fail to teach or suggest the present invention.

The Federal Circuit has held that a *prima facie* case of obviousness must establish: (1) some suggestion or motivation to modify the references; (2) a reasonable expectation of success; and (3) that the prior art references teach or suggest all claim limitations. Amgen, Inc. v. Chugai Pharm. Co., 18 USPQ2d 1016, 1023 (Fed. Cir. 1991; In re Fine, 5 USPQ2d 1596, 1596 (Fed. Cir. 1988); In re Wilson, 165 USPQ 494, 496 (C.C.P.A. 1970).

A *prima facie* case of obviousness must also include a showing of the reasons why it would be obvious to modify the references to produce the present invention. Ex parte Clapp, 277 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985). The examiner bears the initial burden of providing some convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings. Id. at 974.

As recited in claim 1 amended herein, the present application claims:

> "A method for surface toughening of a ceramics sintered material cutting tool comprising, plastic working said ceramics sintered material cutting tool with an abrasive composed of fine particles, said fine particles having a convexly curved surface and an

average particle size of 0.1μm to 200μm and a Vickers hardness (HV) ranging from 500 to a value which is the hardness of said sintered material cutting tool plus 50, whereby a uniformly distributed linear dislocation structure is formed in subsurface regions of the ceramics sintered material cutting tool."

Thus, as recited, the method of the present invention comprises treating an existing sintered material cutting tool by plastic working the cutting tool with an abrasive, where the abrasive is composed of fine particles which have a convexly curved surface, an average particle size of 0.1μm to 200μm and a Vickers hardness which is in the range of from 500 to a value which corresponds to the hardness of the cutting tool plus 50. The plastic working is carried out by shot blasting the cutting tool with the fine particles. As is clear from the recitation and the specification, the fine particles of the abrasive are separate and distinct from the sintered material from which the cutting tool is formed.

Accordingly, the examiner's reliance on the disclosure of Yamamoto, et al., with respect to the particle size of the alumina particles from which the sintered alumina ceramic of the reference is made is misplaced. Indeed, Yamamoto, et al., fails to disclose or suggest any method or process whereby the sintered alumina ceramic of the reference is treated to plastic working by shot blasting with an abrasive. Rather, the method of producing the ceramic of the reference comprises preparing a raw material

mixture of the alumina particles cited by the examiner and a Group 3A metal oxide, firing a molding of the mixture and subjecting the resulting product to hot isostatic pressing. Thus, not only is Yamamoto, et al., silent as to a linear dislocation in the ceramics sintered material, it is silent with respect to any feature of the method of the present invention as recited in the claims amended herein. As such, there is no reasonable expectation that one of ordinary skill in the art would be motivated by the teaching of Yamamoto, et al., to consider a further treatment of the sintered alumina ceramic product of the reference, either by shot blasting with an abrasive composed of fine particles, or by any other means.

Nawa, et al., likewise fails to disclose or suggest the method of the present invention whereby a sintered material cutting tool is treated by plastic working with an abrasive composed of fine particles as recited herein. As with Yamamoto, et al., Nawa, et al., discloses the production of a ZrO_2-Al_2O_3 composite ceramic material preparing a mixture of powder grains ZrO_2 and powder grains of Al_2O_3, molding the resulting mixture to the desired shape to obtain a green compact and sintering the green compact in an oxygen containing atmosphere ([0037]). After sintering, hot isostatic pressing may be performed in the oxygen containing atmosphere ([0046]). There is no disclosure on this reference of plastic working the sintered material with an abrasive composed of fine particles having the characteristics recited herein. The fact that Nawa, et al., discloses that the

Al_2O_3 particle size is in the range of 0.1 to 0.5μm, is not relevant to the present invention since the Al_2O_3 particles form part of the final sintered ceramic product of the reference, not an abrasive to be used for plastic working to sintered ceramic.

Thus, even if Nawa, et al., discloses that the residual stress generated around each of the grains of the ceramic product cause dislocations within the crystal grains, the reference fails to disclose or suggest the plastic working of the ceramic sintered material with an abrasive composed of fine particles having the properties recited herein. Accordingly, there is no motivation in Nawa, et al., to modify Yamamoto, et al., to obtain the present invention. Even if, as suggested by the examiner, one modifies Yamamoto, et al., to include the dislocation occurring in the crystal grains of the ceramic material in the cooling process after sintering as taught by Nawa, et al., there is no teaching or suggestion which would lead one of ordinary skill in the art to apply the method of plastic working to such sintered material as recited in the present claims.

In view of the foregoing, Applicants respectfully submit that the examiner has failed to establish a *prima facie* case of obviousness since the references do not teach or suggest all of the claim limitations; in the absence of some suggestion to apply a plastic working of the ceramics material, there is no suggestion or motivation to modify the references; and, there is no reasonable expectation of success.

Thus, in the absence of any such suggestion, Applicants

respectfully submit that a *prima facie* case of obviousness of the present invention over the references to Yamamoto, et al., and Nawa, et al., has not been made and that the rejection of claims 1-2 and 4-5, as amended herein, is without support and should be withdrawn.

Allowable Subject Matter

The examiner has indicated that claim 3 would be allowable if the 35 U.S.C. §112 rejection is overcome and if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The examiner notes that the prior art fails to disclose a surface toughening of ceramics sintered material cutting tool in which a plastic working is carried out by shot blasting with the specific pressure range of 0.1 to 0.5 MPa, a speed of 20 m/sec to 250 m/sec, shot blasting amount of 50 g/m to 800 g/m and shot blasting time of 0.1 sec/cm^2 or more to 60 sec/sm^2 or less.

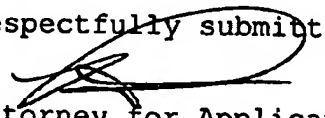
By the foregoing amendment, Applicants herewith present new claims 6-10, where claim 6 corresponds to claim 3 as amended to overcome the rejection under 35 U.S.C. §112 and rewritten to include the limitations of claim 1 from which claim 3 depends. Accordingly, Applicants respectfully submit that new claim 6 is allowable by the examiner's own admission and that claims 7-10, as dependent from claim 6, are likewise allowable.

Conclusion

In view of the foregoing, Applicants respectfully submit that the examiner's rejections have been overcome and that the claims as presented herein are allowable over the prior art.

An early notification of allowance is earnestly solicited.

Respectfully submitted,



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